Supplemental Tables:

.

Supplemental Table 1. Geometrical properties of right femora for pioglitazone-treated and control mice

	Male		Female		OVX	
	Vehicle	**Pio**	**Vehicle**	**Pio**	**Vehicle**	**Pio**
n	**8**	**11**	**8**	**12**	**9**	**11**
A-P Diameter (mm)	1.37 ± 0.03	1.32 ± 0.03	1.29 ± 0.01	1.29 ± 0.02	1.32 ± 0.02	1.29 ± 0.01
Moment of Inertia (mm^4)	0.244 ± 0.020	0.210 ± 0.024	0.189 ± 0.005	0.189 ± 0.005	0.177 ± 0.006	0.191 ± 0.007
Cross-sectional bone area (mm^2)	1.16 ± 0.02	1.06 ± 0.05	1.10 ± 0.01	1.10 ± 0.02	0.99 ± 0.02	0.98 ± 0.02
Cortical Thickness (mm)	0.210 ± 0.003	0.201 ± 0.003	0.231 ± 0.002	0.236 ± 0.002	0.205 ± 0.004	0.200 ± 0.004

Values reported as mean ± standard error.

Supplemental Table 2. Femoral three-point bending results for pioglitazone-treated and control mice

	Male		Female		OVX	
	Vehicle	**Pio**	**Vehicle**	**Pio**	**Vehicle**	**Pio**
n	**8**	**10**	**8**	**12**	**9**	**11**
Structural Properties						
Ultimate Load (N)	20.3 ± 0.9	18.3 ± 0.6	24.5 ± 0.7	24.8 ± 0.9	16.3 ± 1.3	16.1 ± 1.0
Failure Displacement (mm)	0.55 ± 0.09	0.58 ± 0.06	0.43 ± 0.04	0.40 ± 0.03	0.30 ± 0.03	0.44 ± 0.08
Energy to Failure (mJ)	8.2 ± 1.1	7.5 ± 0.8	7.3 ± 0.8	6.7 ± 0.4	3.2 ± 0.6	4.5 ± 0.8
Stiffness (N/mm)	152.5 ± 6.4	137.8 ± 8.9	177.2 ± 5.5	165.1 ± 8.1	149.5 ± 5.5	149.7 ± 5.2
Material Properties						
Ultimate Stress (MPa)	87.4 ± 4.2	94.8 ± 4.2	125.5 ± 5.8	126.8 ± 3.1	91.3 ± 6.1	92.5 ± 7.7
Failure Strain (%)	12.5 ± 1.9	12.6 ± 1.6	9.1 ± 0.9	8.5 ± 0.6	6.6 ± 0.7	9.5 ± 1.7
Toughness (MPa)	7.9 ± 1.0	8.3 ± 0.9	8.0 ± 0.9	7.4 ± 0.5	3.8 ± 0.7	4.8 ± 1.1
Young's Modulus (MPa)	2905.8 ± 184.2	3420.0 ± 357.9	4224.9 ± 151.8	3923.5 ± 166.4	3820.3 ± 114.0	4035.4 ± 347.6

Values reported as mean ± standard error.

Supplemental Table 3. Femoral neck fracture results for pioglitazone-treated and control mice

	Male		Female		OVX	
	Vehicle	**Pio**	**Vehicle**	**Pio**	**Vehicle**	**Pio**
n	**8**	**11**	**8**	**12**	**9**	**11**
Structural Properties						
Ultimate Load (N)	26.3 ± 2.8	22.0 ± 1.4	21.5 ± 0.8	21.0 ± 1.3	15.9 ± 1.3	17.0 ± 0.9
Failure Displacement (mm)	0.26 ± 0.04	0.28 ± 0.03	0.21 ± 0.02	0.23 ± 0.02	0.22 ± 0.03	0.25 ± 0.03
Energy to Failure (mJ)	3.7 ± 0.6	3.8 ± 0.5	2.8 ± 0.3	3.1 ± 0.4	2.1 ± 0.4	2.5 ± 0.3
Stiffness (N/mm)	146.7 ± 12.8	130.7 ± 10.8	136.4 ± 12.7	136.2 ± 8.3	105.5 ± 10.6	102.5 ± 8.8

Values reported as mean ± standard error.

Supplemental Table 4. Osteoclast staining in pioglitazone-treated and control mice

	Male		Female		OVX	
	Vehicle	**Pio**	**Vehicle**	**Pio**	**Vehicle**	**Pio**
n	**7**	**11**	**8**	**12**	**9**	**11**
Number of Osteoclasts (-)	43 ± 5	56 ± 5	64 ± 6	64 ± 5	45 ± 4	36 ± 4
Osteoclast Surface (mm)	0.99 ± 0.16	1.12 ± 0.09	1.28 ± 0.10	1.67 ± 0.16	0.93 ± 0.11	0.76 ± 0.09
Percent Osteoclast Surface (%)	8.2 ± 1.5	9.0 ± 0.7	13.4 ± 1.8	17.3 ± 1.7	10.1 ± 1.4	9.8 ± 1.0
Number of Osteoclasts per Bone Surface (mm^{-1})	3.5 ± 0.4	4.5 ± 0.3	6.7 ± 1.0	6.6 ± 0.4	4.9 ± 0.5	4.6 ± 0.5
Number of Osteoclasts per Osteoclast Surface	45.8 ± 2.9	50.5 ± 2.4	50.5 ± 4.6	39.5 ± 1.6*	52.5 ± 5.9	48.6 ± 3.9

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to vehicle-treated controls*

Supplemental Table 5. Geometrical properties of right femora for sitagliptin-treated and control vehicle-treated mice

	Male		Female		OVX	
	Vehicle	**Sitagliptin**	**Vehicle**	**Sitagliptin**	**Vehicle**	**Sitagliptin**
n	**11**	**10**	**8**	**8**	**9**	**12**
A-P Diameter (mm)	1.30 ± 0.03	1.31 ± 0.02	1.29 ± 0.01	1.32 ± 0.02	1.32 ± 0.02	1.30 ± 0.01
Moment of Inertia (mm^4)	0.158 ± 0.011	0.165 ± 0.010	0.189 ± 0.005	0.198 ± 0.005	0.177 ± 0.006	0.184 ± 0.006
Cross-sectional bone area (mm^2)	0.87 ± 0.02	0.99 ± 0.10	1.10 ± 0.01	1.12 ± 0.02	0.99 ± 0.02	0.97 ± 0.01
Cortical Thickness (mm)	0.167 ± 0.012	0.168 ± 0.003	0.231 ± 0.002	0.234 ± 0.003	0.205 ± 0.004	0.200 ± 0.003

Values reported as mean ± standard error.

Supplemental Table 6. Femoral three-point bending results for sitagliptin-treated and vehicle-treated control mice

	Male		Female		OVX	
	Vehicle	**Sitagliptin**	**Vehicle**	**Sitagliptin**	**Vehicle**	**Sitagliptin**
n	**11**	**10**	**8**	**8**	**9**	**12**
Structural Properties						
Ultimate Load (N)	17.7 ± 0.6	17.9 ± 0.6	24.5 ± 0.7	23.6 ± 0.9	16.3 ± 1.3	17.3 ± 0.5
Failure Displacement (mm)	0.51 ± 0.07	0.53 ± 0.06	0.43 ± 0.04	0.53 ± 0.08	0.30 ± 0.03	0.33 ± 0.04
Energy to Failure (mJ)	6.1 ± 0.8	6.3 ± 0.7	7.3 ± 0.8	7.8 ± 0.9	3.2 ± 0.6	3.7 ± 0.5
Stiffness (N/mm)	123.7 ± 5.8	129.0 ± 3.7	177.2 ± 5.5	179.6 ± 10.9	149.5 ± 5.5	144.9 ± 4.2
Material Properties						
Ultimate Stress (MPa)	124.4 ± 7.2	114.3 ± 3.2	94.4 ± 5.8	117.8 ± 4.6	91.3 ± 6.1	92.2 ± 3.3
Failure Strain (%)	10.6 ± 1.4	11.6 ± 1.3	9.1 ± 0.9	11.6 ± 1.7	6.6 ± 0.7	7.1 ± 0.8
Toughness (MPa)	9.2 ± 1.3	8.7 ± 0.9	8.0 ± 0.9	8.7 ± 1.1	3.8 ± 0.7	4.3 ± 0.6
Young's Modulus (MPa)	4205.4 ± 391.4	3784.2 ± 154.4	4224.9 ± 151.8	4077.7 ± 222.9	3820.3 ± 114.0	3569.6 ± 136.1

Values reported as mean ± standard error.

Supplemental Table 7. Femoral neck fracture results for sitagliptin-treated and vehicle-treated control mice

	Male		Female		OVX	
	Vehicle	**Sitagliptin**	**Vehicle**	**Sitagliptin**	**Vehicle**	**Sitagliptin**
n	**11**	**10**	**8**	**8**	**9**	**10**
Structural Properties						
Ultimate Load (N)	20.4 ± 2.1	20.0 ± 1.7	21.5 ± 0.8	21.1 ± 1.5	15.9 ± 1.3	14.9 ± 1.0
Failure Displacement (mm)	0.31 ± 0.03	0.33 ± 0.02	0.21 ± 0.02	0.28 ± 0.02	0.22 ± 0.03	0.18 ± 0.01
Energy to Failure (mJ)	4.0 ± 0.6	4.0 ± 0.3	2.8 ± 0.3	3.7 ± 0.5	2.1 ± 0.4	1.6 ± 0.2
Stiffness (N/mm)	112.3 ± 5.4	102.6 ± 6.1	136.4 ± 12.7	132.3 ± 11.2	105.5 ± 10.6	99.2 ± 4.9

Values reported as mean ± standard error.

Supplemental Table 8. Vertebral Compression for sitagliptin-treated and control mice

	Male		Female		OVX	
	Vehicle	**Sitagliptin**	**Vehicle**	**Sitagliptin**	**Vehicle**	**Sitagliptin**
n	**11**	**10**	**8**	**8**	**11**	**10**
Structural Properties						
Ultimate Load (N)	30.7 ± 2.5	30.2 ± 2.3	25.8 ± 2.5	25.3 ± 2.9	19.9 ± 2.1	15.1 ± 1.8
Failure Displacement (mm)	0.31 ± 0.02	0.35 ± 0.03	0.42 ± 0.07	0.42 ± 0.08	0.37 ± 0.05	0.39 ± 0.05
Energy to Failure (mJ)	5.4 ± 0.5	6.0 ± 0.4	6.9 ± 1.4	6.5 ± 1.2	4.3 ± 0.8	3.7 ± 0.6
Stiffness (N/mm)	161.3 ± 17.0	149.2 ± 19.2	113.3 ± 11.1	87.4 ± 13.1	108.8 ± 17.6	76.5 ± 13.0
Material Properties						
Ultimate Stress (MPa)	13.7 ± 1.1	12.8 ± 1.1	10.3 ± 1.1	10.8 ± 1.3	9.3 ± 0.9	6.4 ± 0.8
Failure Strain (%)	10.4 ± 0.6	11.2 ± 0.9	13.1 ± 2.2	12.5 ± 2.0	11.9 ± 1.6	12.6 ± 1.8
Toughness (MPa)	0.81 ± 0.07	0.83 ± 0.07	0.87 ± 0.18	0.86 ± 0.18	0.64 ± 0.12	0.50 ± 0.08
Young's Modulus (MPa)	211.3 ± 20.8	192.9 ± 24.6	145.9 ± 15.8	123.7 ± 18.5	162.9 ± 29.18	105.6 ± 19.1*

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to vehicle-treated control mice*

Supplemental Table 9. Osteoclast staining results for sitagliptin-treated and control mice

	Male		Female		OVX	
	Vehicle	**Sitagliptin**	**Vehicle**	**Sitagliptin**	**Vehicle**	**Sitagliptin**
n	**9**	**10**	**8**	**8**	**9**	**11**
Number of Osteoclasts (-)	66 ± 6	61 ± 6	64 ± 6	53 ± 7	45 ± 4	52 ± 6
Osteoclast Surface (mm)	1.2 ± 0.1	1.1 ± 0.1	1.3 ± 0.1	1.3 ± 0.3	0.93 ± 0.11	1.5 ± 0.3
Percent Osteoclast Surface (%)	7.1 ± 1.0	6.2 ± 0.7	13.4 ± 1.8	14.0 ± 2.2	10.1 ± 1.4	12.8 ± 1.9
Number of Osteoclasts per Bone Surface (mm^{-1})	3.9 ± 0.5	3.4 ± 0.4	6.7 ± 1.0	5.7 ± 0.6	4.9 ± 0.5	4.6 ± 0.5
Number of Osteoclasts per Osteoclast Surface (mm^{-1})	56.7 ± 2.1	55.3 ± 1.0	50.5 ± 4.6	42.9 ± 2.7	52.5 ± 5.9	39.3 ± 3.8

Values reported as mean ± standard error.

Supplementary Table 10. Femoral three-point bending results for Dpp4-/- (KO) and WT mice

	Male		Female		OVX	
	WT	**KO**	**WT**	**KO**	**WT**	**KO**
n	**14**	**23**	**14**	**17**	**10**	**13**
Structural Properties						
Ultimate Load (N)	17.0 ± 0.6	16.2 ± 0.5	20.8 ± 0.9	20.8 ± 0.7	16.9 ± 0.7	15.5 ± 0.7
Failure Displacement (mm)	0.70 ± 0.11	0.55 ± 0.06	0.30 ± 0.04	0.41 ± 0.04	0.29 ± 0.04	0.34 ± 0.04
Energy to Failure (mJ)	7.9 ± 1.0	6.1 ± 0.6	4.3 ± 0.7	5.7 ± 0.65	3.5 ± 0.6	3.4 ± 0.5
Stiffness (N/mm)	139.3 ± 3.7	132.7 ± 5.6	165.2 ± 6.6	163.0 ± 6.8	154.7 ± 3.6	131.1 ± 6.6*
Material Properties						
Ultimate Stress (MPa)	105.6 ± 3.9	99.4 ± 4.1	147.7 ± 5.3	147.7 ± 4.8	115.8 ± 6.8	129.5 ± 7.3
Failure Strain (%)	14.7 ± 2.6	13.1 ± 1.5	6.7 ± 0.8	9.2 ± 1.0	6.6 ± 0.8	7.5 ± 1.0
Toughness (Mpa)	10.9 ± 1.5	8.7 ± 0.9	6.8 ± 1.1	9.2 ± 1.1	5.5 ± 0.9	7.0 ± 1.0
Young's Modulus (Mpa)	3889.7 ± 260.1	3534.8 ± 214.7	5253.4 ± 243.1	5141.4 ± 255.5	4546.0 ± 163.6	5028.1 ± 214.2

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to wildtype control*

Supplementary Table 11. Femoral neck fracture results for Dpp4-/- (KO) and WT mice

	Male		Female		OVX	
	WT	**KO**	**WT**	**KO**	**WT**	**KO**
n	**14**	**23**	**13**	**16**	**10**	**13**
Structural Properties						
Ultimate Load (N)	22.5 ± 0.9	22.6 ± 1.0	17.8 ± 0.8	17.5 ± 0.9	18.1 ± 0.7	13.3 ± 0.5*
Failure Displacement (mm)	0.27 ± 0.03	0.26 ± 0.02	0.23 ± 0.03	0.30 ± 0.04	0.28 ± 0.02	0.26 ± 0.02
Energy to Failure (mJ)	3.4 ± 0.3	3.2 ± 0.2	2.4 ± 0.3	3.2 ± 0.4	2.9 ± 0.2	2.1 ± 0.2*
Stiffness (N/mm)	121.7 ± 8.8	135.5 ± 9.7	115.8 ± 11.3	104.2 ± 8.8	114.5 ± 4.8	83.0 ± 4.7*

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to wildtype control*

Supplemental Table 12. Vertebral compression results for Dpp4-/- (KO) and WT mice

	Male		Female		OVX	
	WT	**KO**	**WT**	**KO**	**WT**	**KO**
n	**13**	**21**	**12**	**19**	**9**	**13**
Structural Properties						
Ultimate Load (N)	24.1 ± 2.9	17.2 ± 1.3*	17.7 ± 2.2	19.7 ± 1.6	18.6 ± 1.5	14.4 ± 2.2
Failure Displacement (mm)	0.34 ± 0.05	0.34 ± 0.09	0.36 ± 0.06	0.36 ± 0.04	0.39 ± 0.05	0.38 ± 0.05
Energy to Failure (mJ)	5.0 ± 1.0	3.8 ± 0.5	4.1 ± 0.8	4.4 ± 0.7	4.8 ± 0.9	3.9 ± 0.9
Stiffness (N/mm)	129.4 ± 20.6	83.8 ± 7.4	83.8 ± 11.3	114.1 ± 10.0	89.1 ± 10.5	74.1 ± 9.7
Material Properties						
Ultimate Stress (Mpa)	9.8 ± 1.3	7.3 ± 0.5	7.4 ± 0.9	8.5 ± 0.7	8.0 ± 0.7	6.5 ± 1.0
Failure Strain (%)	10.4 ± 1.5	10.5 ± 0.9	11.2 ± 1.7	10.1± 1.2	12.6 ± 1.5	12.2 ± 1.5
Toughness (Mpa)	0.62 ± 0.11	0.49 ± 0.06	0.54 ± 0.10	0.55 ± 0.09	0.68 ± 0.14	0.56 ± 0.13
Young's Modulus (Mpa)	169.1 ± 27.1	118.8 ± 11.5	113.4 ± 16.5	161.5 ± 13.9*	119.4 ± 16.2	103.2 ± 15.0

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to wildtype control*

Supplemental Table 13. Vertebral trabecular architecture in Dpp4-/- (KO) and WT mice

	Male		Female		OVX	
	WT	**KO**	**WT**	**KO**	**WT**	**KO**
n	**15**	**23**	**13**	**16**	**10**	**13**
BV/TV (%)	26.2 ± 1.4	25.2 ± 0.9	23.8 ± 1.5	20.4 ± 0.9	19.5 ± 1.3	19.1 ± 1.1
Tb.Th. (μm)	68.2 ± 0.7	65.1 ± 1.0*	66.7 ± 1.4	66.9 ± 0.9	62.1 ± 0.7	60.6 ± 0.7
Tb.N. (mm^{-1})	3.8 ± 0.2	3.9 ± 0.1	3.6 ± 0.2	2.9 ± 0.2*	3.1 ± 0.2	3.2 ± 0.2
Tb.Sp. (μm)	199.9 ± 13.1	200.2 ± 4.9	260.8 ± 18.8	272.0 ± 17.3	223.4 ± 23.0	223.4 ± 20.4

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to wildtype control*

Supplemental Table 14. Vertebral trabecular connectivity for Dpp4-/- (KO) and WT mice

		Male		Female		OVX	
		WT	**KO**	**WT**	**KO**	**WT**	**KO**
	n	**15**	**22**	**13**	**18**	**10**	**11**
Measures of Connectivity	**Total Strut Length (mm/mm^2)**	4.70 ± 0.22	4.63 ± 0.18	3.94 ± 0.22	3.94 ± 0.30	3.21 ± 0.20	2.99 ± 0.16
	Number of Nodes (mm^{-2})	8.8 ± 0.6	9.4 ± 0.8	10.0 ± 1.4	10.3 ± 1.6	5.9 ± 0.8	5.2 ± 0.6
	Length of Node-Node Struts (mm/mm^2)	1.21 ± 0.21	1.12 ± 0.15	1.02 ± 0.16	1.25 ± 0.22	0.78 ± 0.19	0.54 ± 0.10
	Length of Node-Free Struts (mm/mm^2)	1.57 ± 0.12	1.54 ± 0.10	1.56 ± 0.16	0.98 ± 0.07*	1.03 ± 0.10	0.94 ± 0.12
Measures of Disconnectivity	**Number of Free Ends (mm^{-2})**	15.3 ± 0.8	14.9 ± 0.6	14.7 ± 1.7	12.9 ± 1.0	10.6 ± 0.4	10.5 ± 0.4
	Length of Free-Free Struts (mm/mm^2)	0.60 ± 0.08	0.67 ± 0.08	0.49 ± 0.05	0.56 ± 0.07	0.46 ± 0.05	0.51 ± 0.07

*Values reported as mean ± standard error. * Significant ($p \leq 0.05$) compared to wildtype control*

Supplemental Table 15. Osteoclast staining for Dpp4-/- (KO) and WT mice

	Male		Female		OVX	
	WT	**KO**	**WT**	**KO**	**WT**	**KO**
n	**9**	**9**	**8**	**13**	**9**	**13**
Number of Osteoclasts (-)	55 ± 6	43 ± 5	74 ± 10	60 ± 4	51 ± 5	55 ± 5
Osteoclast Surface (mm)	0.89 ± 0.15	0.60 ± 0.08	1.1 ± 0.2	0.93 ± 0.06	0.96 ± 0.13	0.91 ± 0.07
Percent Osteoclast Surface (%)	5.6 ± 0.8	3.9 ± 0.4	8.6 ± 1.4	8.3 ± 0.9	7.3 ± 0.7	7.6 ± 0.6
Number of Osteoclasts per Bone Surface (mm^{-1})	3.6 ± 0.4	2.8 ± 0.3	5.9 ± 0.9	5.3 ± 0.4	4.0 ± 0.4	4.5 ± 0.3
Number of Osteoclasts per Osteoclast Surface	66.7 ± 3.8	72.7 ± 2.7	69.7 ± 2.9	65.4 ± 2.0	59.5 ± 2.1	60.2 ± 2.0

Values reported as mean ± standard error